

water, at no great distance from land, for in the first warm weather of spring and early summer young turbot of 8 cm. to 13 cm. (3 in. to 5 in.) in length are found along the sandy beaches of the British Isles. There would probably be no difficulty in getting turbot ova from a hatching-station like that of Dunbar, and in conveying them to this colony. Dr. Fulton is of opinion that under proper conditions adult fish could also be conveyed to New Zealand just before the spawning season.

Crabs.—Some years ago, before the Otago Acclimatisation Society made its successful importation of lobsters, I wrote to Professor G. O. Sars, of Christiania, on the subject of introducing crabs; but he was of opinion that they would prove much more difficult to bring out than lobsters. At the Dunbar hatcheries, however, crabs have been kept in confinement for months, and Dr. Fulton anticipates that there would be no difficulty in conveying them to this colony.

The second point suggested for consideration in this matter is what we require to know about local conditions as affecting the possibility of carrying any experiment for the introduction of sea-fish to a successful issue. The principal points we ought to know are: (1) the temperature of the sea throughout the year; (2) the direction and speed of the ocean currents; (3) the spawning time of the native species, and when their eggs and larvae are found in the greatest abundance in the sea; for, as Dr. Fulton points out, "it can scarcely be doubted that that would be the preferable time to introduce the new forms, as the minute life upon which larval fishes prey is then most abundant, and the other conditions most suitable."

In regard to the temperature of the sea, observations of the sea temperature round the coast were made for twelve months in 1868, and the results were published by Sir James Hector in a report to Parliament, 2nd December, 1869. An abstract of this report appears in his introduction to "Notes on the Edible Fishes of New Zealand," published in 1872. Sir James Hector informs me that this is the only information on the subject. It is very meagre, and we can only regret that during all these years in which the "Hinemoa" has been regularly going round these islands supplying the lighthouses from Cape Maria van Diemen to Puysegur Point an attempt has not been made by the Marine Department to secure a regular series of observations. It is not too late yet to make a beginning.

Satisfactory information as to the spawning-time of the native species of fish is not yet available, and will not be for many years—until, indeed, systematic observations of this and cognate facts have been carried out for a series of years. The catalogue of "New Zealand Fishes," by Hutton, and the "Notes on Edible Fishes," by Hector, published in 1872, contains no information on the subject. When Mr. L. Wilson was in charge of the Marine Department an attempt was made to gather statistics on this subject from the lighthouse-keepers round the coast. These men, though a most intelligent body of public servants, had no special knowledge of the subject, and their reports were found to be of comparatively little scientific value. The results, such as they were, were published by me in a paper which appears in the 24th volume of the "Transactions of the New Zealand Institute," page 202. Selecting only those species of which the observations regarding the maturing of the ova were at all uniform, I find that none had ripe ova in June or July, one in August, five in September, four in October, eight in November, five in December, eight in January, four in February, two in March, and one each in April and May. This result, imperfect as it is, would seem to show that the majority of our species spawn in the late spring and the summer months, and it is probably then, of course, that the pelagic food-supply would be found to be most abundant. If, therefore, the ova of cod, herring, or turbot were to be introduced into the colony they would arrive at the middle of our winter, when it is pretty safe to infer that the pelagic food-supply would be at the minimum. On the other hand, I have found that even in the depth of winter there is an immense amount of minute life (copepoda, larval decapoda, medusæ, worms, &c.) floating near the surface, and which is taken in the tow-net; and it is more than probable that the amount available for feeding larval fish would be very large. Of course, if it were possible to bring out adult fish of the species named, and confine them in ponds, the success of the experiment would be assured. The ova could then be dealt with whenever it matured, and the larval fish be kept in rearing-ponds till it was time to liberate them.

No scheme for introduction of fish or fish-ova into the colony would be complete unless full provision was made for the keeping of such fish in confinement after arrival, and the hatching of the ova in suitable apparatus. Full particulars of the Dunbar hatchery are given in the Twelfth Annual Report of the Scotch Fishery Board, and without going into details of the whole I will very briefly specify the general arrangements. The fish from which the ova are procured are either caught in the nets of the Board's steamer, the "Garland," or are obtained from the fishing-boats and transferred to the tanks on board the steamer. They are got either just when ripe, as required, or are secured beforehand and kept in suitable enclosures. The details of the collecting and placing of the ova need not detain us here. The spawning-pond is constructed of concrete, and is sunk in the ground. It is 40½ ft. long, 11 ft. deep, 26½ ft. broad at one end, and 18 ft. at the other, and is capable of holding about 10,000 cubic feet, or 62,000 gallons of water. The water is supplied by 4 in. galvanised-iron pipes from the harbour, a distance of over 100 yards, and the pumps are worked by an 8-horse-power engine. Below the spawning-pond is a filtering and spawn-collecting chamber, 27 ft. long, 12 ft. broad, and 8 ft. high, built of wood and covered with corrugated iron. Below this again is the hatching-house, a wooden building 35 ft. long, 24 ft. broad, and 20 ft. high, containing the hatching apparatus. There is also a tidal pond, made by enclosing a small natural inlet of the sea, which is about 40 ft. long, and this serves not only as a supply from which filtered water can be drawn in stormy weather, but as an additional storage-pond for spawning fish. Such an establishment would cost in this colony, for erection alone, about £350—that is, a building with brick foundations, timber walls lined inside, and spawning-pond of masonry, in cement mortar, or concrete. The laboratory, boiler-house, tanks, boiler, and pumps to lift 7,000 gallons per hour would cost from £150 to £200. These estimates have been very kindly worked out for me by Mr. G. M. Barr, C.E., to whom I take this opportunity of expressing my obligations, and who assures me that they are on the over rather than on the under-side. To these items would have to be added the cost of, say, eight hatching-boxes, which it would be best to have constructed either in Britain or in Norway, and imported ready for putting together. I suppose £100 would cover the total expense of making and importing them. This brings up the total cost of erection and fitting-up of such a station to £650. The locality would have to be within easy distance of one of the principal ports, so that fish or ova could be transferred without the loss of many hours direct from the steamer to the hatchery. I believe that a suitable site could be obtained in the neighbourhood of any of the principal harbours of the colony, and none better perhaps than just within the entrance of Purakanui Inlet, or of Otago Harbour, on the north spit. There would be an important geographical advantage in having such a hatchery here. The general drift of the ocean current outside Otago Heads is in a northerly direction, and this current extends to abreast of Cook Strait. By means of it a certain number of the pelagic fry of the fish hatched out would be readily spread along the coast-line. On the other hand, a northern station would not be so favourably situated for supplying this part of the colony.

The final and important question is, Would it be advisable at this stage of the colony's progress to undertake the work of introducing these sea-fishes? I think it would. The development of trade with Australia, which may be looked for by the opening of ports like Sydney and Melbourne, will inevitably lead to a demand for fish from New Zealand, these being already considered as generally superior to the fish found on the Australian coasts. In a very few years it is probable that brown-trout, and, to a less extent, salmon-trout, will be extensively taken as sea-fish, as great shoals of these fine fish are now becoming common along the coasts of Otago and Canterbury. And if to these could be added the three finest food-fishes of Britain—the cod, the turbot, and the herring—the fisheries of New Zealand would rank among the most valuable assets of the colony. But there is another and more local way of looking at it. The desirability of establishing a biological station in these islands has often been affirmed, but beyond this stage it has never got. The presence of such a station here would be not only of immense practical value, but also of great scientific importance. Without some such practical side to it I do not think that those in power in New Zealand would be induced to assist the undertaking with public funds. But were our institute to take the initiative in this matter, and devote to it some of the money which has been accumulating as deposit account for several years past, waiting for some such favourable opportunity, then I think we would ere long rejoice in the possession of a biological station which would be of colonial importance, as well as prove a valuable adjunct to our own University.

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